

GAIA-1: A Generative World Model for Autonomous Driving

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Abstract

Autonomous driving promises transformative improvements to transportation, but building systems capable of safely navigating the unstructured complexity of real-world scenarios remains challenging. A critical problem lies in effectively predicting the various potential outcomes that may emerge in response to the vehicle's actions as the world evolves. To address this challenge, we introduce GAIA-1 ('Generative AI for Autonomy'), a generative world model that leverages video, text, and action inputs to generate realistic driving scenarios while offering fine-grained control over ego-vehicle behavior and scene features. Our approach casts world modeling as an unsupervised sequence modeling problem by mapping the inputs to discrete tokens, and predicting the next token in the sequence. Emerging properties from our model include learning high-level structures and scene dynamics, contextual awareness, generalization, and understanding of geometry. The power of GAIA-1's learned representation that captures expectations of future events, combined with its ability to generate realistic samples, provides new possibilities for innovation in the field of autonomy, enabling enhanced and accelerated training of autonomous driving technology.